



COPY OF PAPERS  
ORIGINALLY FILED

THE UNITED STATES PATENT AND TRADEMARK OFFICE

# 7/ Declaration  
Rounded  
8/7/02

In Re Application of: )

Hirst, et al. )

Serial No.: 09/819,925 )

Filed: March 28, 2001 )

For: Fusing System Including an External Heater )

Group Art Unit: 2852

Examiner: Tran, Hoan H.

Docket No.: 10004411-1

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on July 12, 2002.

Mary Meegan  
Signature - Mary Meegan

TECHNOLOGY CENTER 2800

JUL 25 2002

RECEIVED

**DECLARATION OF B. MARK HIRST PURSUANT TO 37 C.F.R. §1.131**


Commissioner of Patents  
Washington, D.C. 20231

Sir,

I, **B. Mark Hirst**, hereby declare that:

1) The invention embodied in the above-identified patent application is directed to fusing systems and devices that incorporate such fusing systems.

2) I am advised that the United States Patent and Trademark Office has rejected one or more claims presently pending in the above-identified patent application based, at least in part, upon United States Patent No. 6,304,741 to *Tange*. I am further advised that the effective filing date of the *Tange* patent is July 10, 2000.



3) The invention, however, as embodied in the claims of the present invention was completed by myself and my co-inventors in this country prior to July 10, 2000. Specifically, the invention was “completed” by virtue of reduction to practice prior to the July 10, 2000 filing date of the *Tange* patent.

4) As evidence that the present invention was so characterized by reduction to practice, Exhibit “A” is attached hereto.

5) Exhibit “A” is a copy of notebook entries from my notebook number 4276. As indicated on pages 37-42 of this notebook, an embodiment of the claimed invention was made and tested with positive results. All of these activities occurred prior to the July 10, 2000 critical date. Note that all dates contained on pages 37-42 have been redacted.

I hereby declare that all statements made herein are of my own knowledge are true and that all statements are made on information and belief and are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 2, 2002  
Date

B. Mark Hirst  
B. Mark Hirst



COPY OF PAPERS  
ORIGINALLY FILED

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Re Application of:

Hirst, et al.

Serial No.: 09/819,925

Filed: March 28, 2001

For: Fusing System Including an External Heater )

)  
)  
) Group Art Unit: 2852

)  
) Examiner: Tran, Hoan H.

)  
) Docket No.: 10004411-1

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on July 12, 2002.

Mary Meegan  
Signature - Mary Meegan

RECEIVED  
JUL 25 2002  
TECHNOLOGY CENTER 2800

**DECLARATION OF KENNETH E. HEATH PURSUANT TO 37 C.F.R. §1.131**



Commissioner of Patents  
Washington, D.C. 20231

Sir,

I, **Kenneth E. Heath**, hereby declare that:

1) The invention embodied in the above-identified patent application is directed to fusing systems and devices that incorporate such fusing systems.

2) I am advised that the United States Patent and Trademark Office has rejected one or more claims presently pending in the above-identified patent application based, at least in part, upon United States Patent No. 6,304,741 to *Tange*. I am further advised that the effective filing date of the *Tange* patent is July 10, 2000.



3) The invention, however, as embodied in the claims of the present invention was completed by myself and my co-inventors in this country prior to July 10, 2000. Specifically, the invention was “completed” by virtue of reduction to practice prior to the July 10, 2000 filing date of the *Tange* patent.

4) As evidence that the present invention was so characterized by reduction to practice, Exhibit “A” is attached hereto.

5) Exhibit “A” is a copy of notebook entries from Mark Hirst’s notebook number 4276. As indicated on pages 37-42 of this notebook, an embodiment of the claimed invention was made and tested with positive results. All of these activities occurred prior to the July 10, 2000 critical date. Note that all dates contained on pages 37-42 have been redacted.

I hereby declare that all statements made herein are of my own knowledge are true and that all statements are made on information and belief and are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 2, 2002  
Date

Kenneth E. Heath  
Kenneth E. Heath



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Hirst, et al.

Serial No.: 09/819,925

Filed: March 28, 2001

For: Fusing System Including an External Heater )

Group Art Unit: 2852

Examiner: Tran, Hoan H.

Docket No.: 10004411-1

TECH CENTER 2800

JUL 25 2002

RECEIVED

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on July 12, 2002.

Mary Meegan  
Signature - Mary Meegan

RECEIVED  
JUL 25 2002  
TECH CENTER 2800

**DECLARATION OF MARK WIBBELS PURSUANT TO 37 C.F.R. §1.131**

Commissioner of Patents  
Washington, D.C. 20231

Sir,

I, **Mark Wibbels**, hereby declare that:

1) The invention embodied in the above-identified patent application is directed to fusing systems and devices that incorporate such fusing systems.

2) I am advised that the United States Patent and Trademark Office has rejected one or more claims presently pending in the above-identified patent application based, at least in part, upon United States Patent No. 6,304,741 to *Tange*. I am further advised that the effective filing date of the *Tange* patent is July 10, 2000.



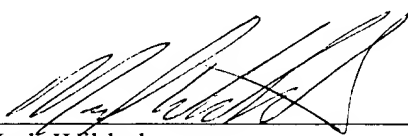
3) The invention, however, as embodied in the claims of the present invention was completed by myself and my co-inventors in this country prior to July 10, 2000. Specifically, the invention was “completed” by virtue of reduction to practice prior to the July 10, 2000 filing date of the *Tange* patent.

4) As evidence that the present invention was so characterized by reduction to practice, Exhibit “A” is attached hereto.

5) Exhibit “A” is a copy of notebook entries from Mark Hirst’s notebook number 4276. As indicated on pages 37-42 of this notebook, an embodiment of the claimed invention was made and tested with positive results. All of these activities occurred prior to the July 10, 2000 critical date. Note that all dates contained on pages 37-42 have been redacted.

I hereby declare that all statements made herein are of my own knowledge are true and that all statements are made on information and belief and are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

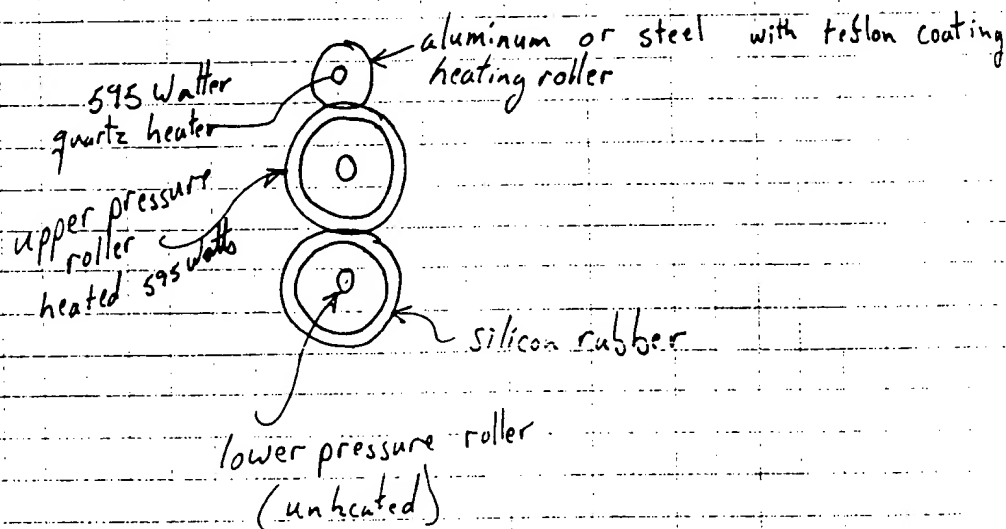
7-2-02  
Date

  
Mark Wibbels

TITLE Fusing System with external heating roller

From Page No. \_\_\_\_\_

Present two roller fusing systems utilize aluminum rollers which are typically covered by a thick layer (4mm) of silicon rubber to maximize the width of the nip area for improved fusing. The silicon rubber is a <sup>poor</sup> thermal conductor which results in a fusing system which requires an excessive amount of time to bring to working temperature. For example, the HP 8500 laser printer requires 4 minutes + 20 seconds to <sup>starting from 23°C.</sup> achieve a working temperature of 180°C with two heated rollers each heated by 595 Watt quartz lamps. <sup>(1190 watts)</sup> Using an external heated metal roller eliminates a great portion of the thermal time delay in the sys. The following system was prototyped with 2 595 heater lamps:



This system reduced warm up time to 2 minutes 50 seconds from 23°C to 180°C.

To Page No. \_\_\_\_\_

Witnessed &amp; Understood by me, \_\_\_\_\_

Date \_\_\_\_\_

Invented by \_\_\_\_\_

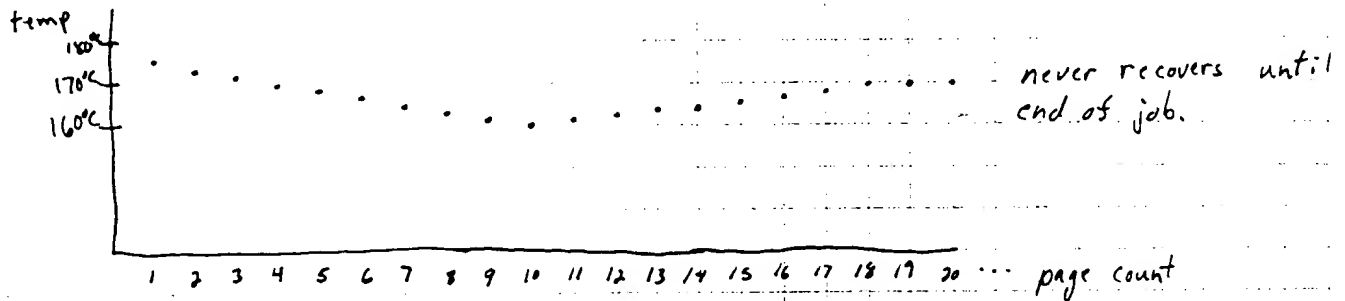
Date \_\_\_\_\_

Recorded by \_\_\_\_\_

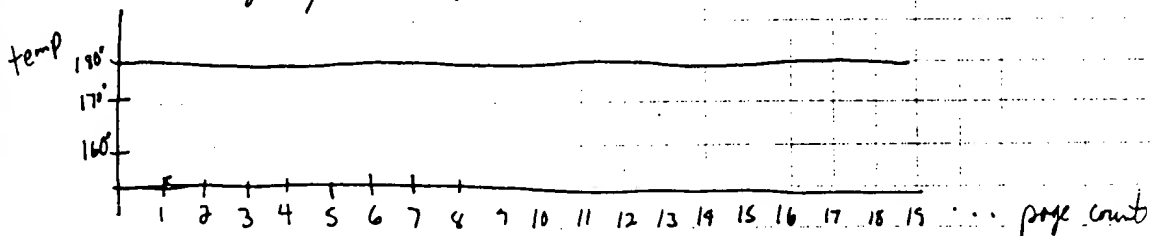
From Page No. 37

Experiments show some additional important benefits. These are: very quick response to thermal loads as well good ride through of sustained thermal loading. Additionally there is no decrease in the gloss of fused toner from one page to the next. The temperature of the fusing system recovers instantly ~~as~~ when the thermal load exits the nip of the fusing pressure rollers.

typical The ride through of present system shows considerable sag. ①



Ride through of new system



The sag in the ride through ① causes the gloss of the fused toner to decrease with every page.

To Page No. 3

Witnessed &amp; Understood by me.

Date

Invented by

Mark Hurd

Date

Recorded by

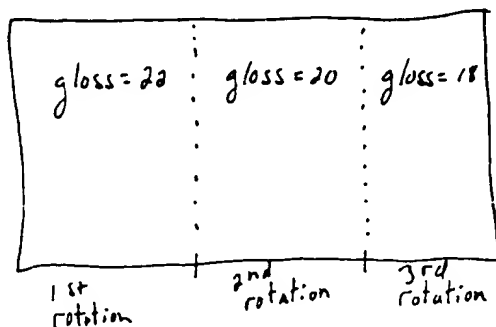
Mark Hurd

From Page No. 39

This system also shows that the teflon coatings and silicon rubber of the pressure rollers can operate reliably at temperatures in excess of  $210^{\circ}\text{C}$ . Tests will be conducted with the surface of the external heating roller at  $220^{\circ}\text{C}$ ,  $230^{\circ}\text{C}$ , and  $240^{\circ}\text{C}$  printing 100,000 pages.

One problem with this design <sup>as well as many other designs</sup> is that the silicon rubber and teflon coatings are insulators and are poor heat conductors as well as possess a small capacity to store heat energy at the surface. This causes the gloss of the fused toner to decrease over the fused page with each full rotation of the pressure rollers.

- For example for a ledger page the gloss for a solid red secondary color is



Fortunately with the external heater the system recovers for the next page.

To Page No. 4

Witnessed &amp; Understood by me.

Date

Invented by *Mark Hurd*

Date

Recorded by

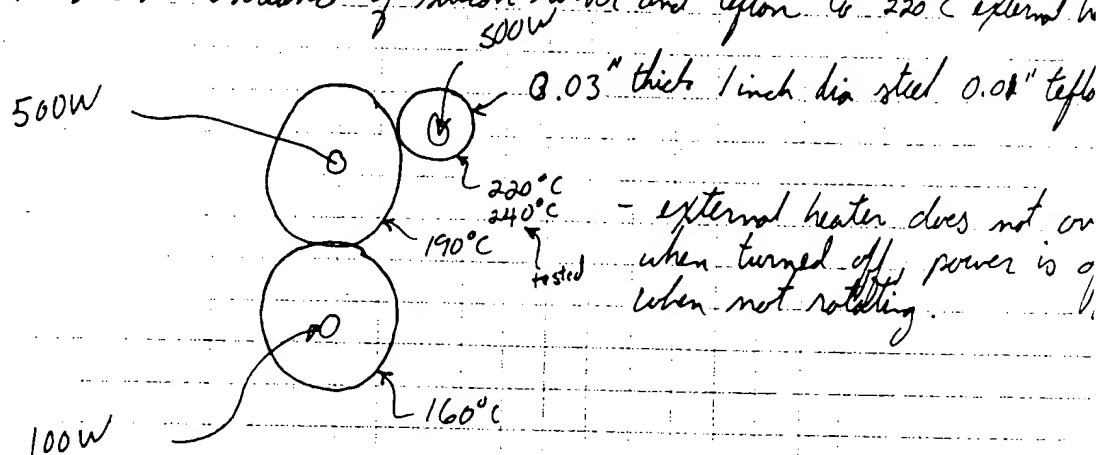
*Mark Hurd*

From Page No. 39

To combat the problem of gloss sag within the page it is necessary to improve the amount of heat that can be carried into the nip of the fuser pressure rollers. A very thin metal layer <sup>at</sup> ~~in~~ the surface of the upper pressure roller should do the trick. This idea is detailed on page 45 of this note book.

A prototype of this system was built with the following:

(system built to test resilience of silicon rubber and teflon to 220°C external h



- as of 44,000 pages have been printed on above system with no failures. a second prototype in which the external heater is controlled at 2: or 240°C will be constructed

64,000 pages printed with no problems

240,000 pages printed on two fusers with no problems

300,000 pages printed on two fusers with no problem

Witnessed &amp; Understood by me,

Date

Invented by

Date

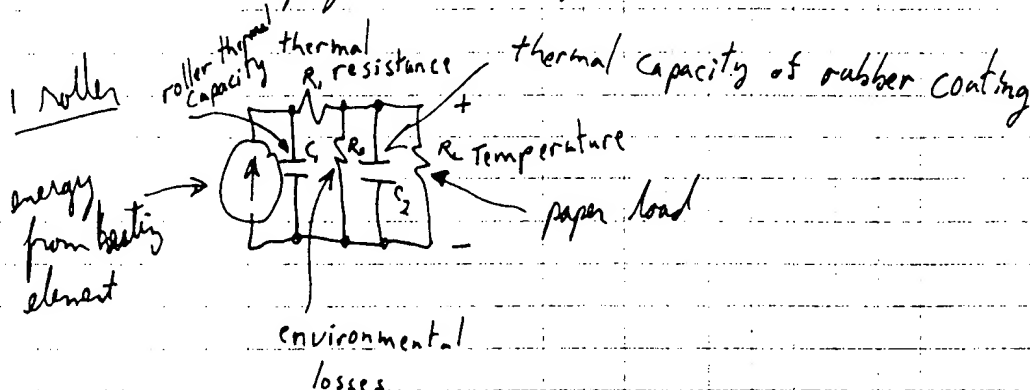
Recorded by

To Page No

From Page No. \_\_\_\_\_

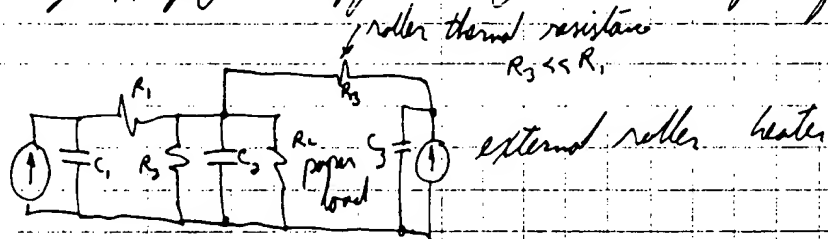
these life tests show no degradation of fuser roller material when heated via contact rolling with  $240^{\circ}\text{C}$  heating roller. This is a 3X life test on two different fusers.

a thermal model for present system is as follows



the problem is that the high thermal resistance of the compliant surface limits energy transport from the fuser.

the external heating roller significantly decreases the thermal resistance of the system by applying energy directly to the surface of the fuser.



To Page No. 4

Witnessed &amp; Understood by me, \_\_\_\_\_

Date \_\_\_\_\_

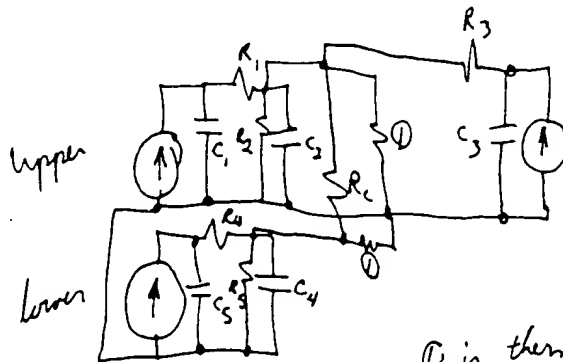
Invented by \_\_\_\_\_

Date \_\_\_\_\_

Recorded by \_\_\_\_\_

From Page No. \_\_\_\_\_

with  
both rollers  
& 1 external heater



external heater/roller  
against upper roller

Q is thermal load of paper as it travels  
between the fuser pressure rollers

$R_c$  is coupling between upper and lower  
rollers

Memo HPC-0405-1459-NO2 details temperature  
comparison experiments.

To Page No. \_\_\_\_\_

Witnessed &amp; Understood by me,

Date

Invented by

Mark Hurd

Date

Recorded by

Mark Hurd